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## Use of Sleep Aids During the First Year of Life

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### Abstract

**Objective.**—In an attempt to foster self-soothing during the night, a novel sleep aid infused with maternal odor was introduced to 4 groups of infants ranging in age from 3 to 12 months. Infants' use of parent-provided sleep aids also was examined.

**Methodology.**—Nighttime sleep and waking behaviors were videotaped for 2 consecutive nights on 3 occasions over a 3-month interval. Using all-night video recording, the study examined the infant's use of a novel sleep aid and parent-provided sleep aids during sleep onset and after nighttime awakenings.

**Results.**—Results indicated that infants of different ages differed in the types of sleep aids used when falling asleep either at the beginning of the night or after awakenings in the middle of the night. More 3-month-olds used their thumbs/fingers/hands, whereas more 6-month-olds used soft objects. The 6-month-olds were most likely to use the novel sleep aid. Almost all of the infants at all 4 ages used some type of object during the night. Intra-individual analyses showed that infants tended to change their pattern of sleep aid use over the 3-month study period.

**Conclusions.**—The data provide evidence that infants during the first year of life use sleep aids frequently and interchangeably rather than a specific favorite object.

Parents of infants and young children regularly consult their pediatricians about how to get their child to fall asleep at the beginning of the night or how to get their child back to sleep after a middle-of-the-night awakening. Prevalence rates for these types of sleep disturbances have been reported to be as high as 20% to 30% for 1- and 2-year-olds.<sup>1,2</sup> Optimally, at some point during the first year of life, an infant should be able to self-soothe, both when falling asleep and after an awakening during the night. How do such self-soothing behaviors become established?

As a prelude to understanding the emergence of nighttime self-soothing behaviors, it is necessary to appreciate the developmental course of sleep, and night waking in particular. During the first few months of life, an infant awakens, on average, every 3 to 4 hours throughout the day and night, usually requiring parental comforting or feeding to return to sleep. By 3 or 4 months of age, the infant's longest period of continuous sleep has lengthened and shifted to the nighttime hours. By 1 year of age, infants are typically sleeping for 6- to 7-hour stretches during the night.<sup>3,4</sup> As the first year progresses, more and more parents report that their infants have "slept through the night." By the time the child is 8 to 9 months of age, 70% of parents report that their infant sleeps through the night regularly.<sup>5</sup>

Sleeping through the night, however, is technically a misnomer. Several studies using objective methods instead of parental report have demonstrated conclusively that infants continue to awaken periodically through the night.<sup>3,6</sup> Thus, although the longest period of sustained sleep has lengthened, it does not span the entire night. Surrounding the longest sleep period are shorter bouts of sleep, punctuated by arousals and awakenings. Arousals can be as brief as 30 seconds or can lead to full awakenings that result in infants either self-soothing or requiring parental presence to reinitiate sleep. Thus, even at 1 year of age, infants rarely sleep through the entire night without several awakenings or arousals. Instead, it is the infant's ability to self-soothe that emerges, allowing parents to sleep through the night.

Clearly, some infants acquire the ability to self-soothe during the first year of life, whereas others continue to awaken their parents, potentially causing a great deal of stress for the family. Recent research has shown that self-soothing is rarely an "all or nothing" construct.<sup>7</sup> Most infants alternate between self-soothing and needing assistance on the same night or on consecutive nights over the first year of life, but tend to lean toward one style or the other. When parental comfort is required persistently beyond an age that parents expect, a sleep problem is presented to the pediatrician.<sup>8,9</sup> It is important, then, to understand how infant self-soothing behaviors evolve and why they may not develop in some children. Factors associated with infant self-soothing at night include the mode of feeding (nursing vs formula), sleep location (crib vs family bed), bedtime and nighttime interactions with the parent, and use of a sleep aid.<sup>7,10</sup> In general, infants are more likely to self-soothe after 4 to 6 months of age when they are not nursed during the night, sleep alone in their own cribs, fall asleep on their own with minimal parental contact, and have access to, and make use of, a sleep aid.

One way that parents promote self-soothing is through the encouragement of the use of sleep aids. A number of studies have reported that infants' use of sleep aids is associated with self-soothing.<sup>5,11,12</sup> A sleep aid is defined as any object (including parts of the child's own body) that a child uses in his/her sleeping environment to facilitate sleep without requiring parental assistance. Several studies have examined children's use of objects, both during the day and at night. The use of a special object at night seems to be quite common among young children in Western cultures. One study reported that 44% of children between the ages of 6 months and 4 years used some type of object at bedtime,<sup>13</sup> and another reported that between 16% to 72% of children aged 3 to 60 months were attached to a pacifier, blanket, or hard object.<sup>14</sup> Age seems to be a significant factor in determining both the likelihood of a child's attachment to a special object as well as the type of object that is used.<sup>13-15</sup>

Two studies have looked at cross-cultural patterns of sleep aid use. One investigation comparing American and Korean children reported that pacifier use is most common among infants under 6 months of age, whereas soft objects are used most often by older infants and preschoolers, regardless of cultural origin.<sup>16</sup> The incidence of object use seems to vary greatly between cultural groups, however. American infants are much more likely to use objects for soothing than are infants in Korea or Guatemala.<sup>16,17</sup> One potential reason for this difference is that in many non-Western cultures, there is more physical contact between infants and mothers during the day and night, and infants are not expected to fall asleep on their own. Indeed, regardless of culture, infants tend to use sleep aids when they are expected to fall asleep on their own.<sup>13</sup>

Some objections have been posed to the use of objects at night. The American Academy of Pediatrics has recommended that soft objects, including pillows, blankets, and stuffed toys, be kept out of the child's crib.<sup>18</sup> The position of the American Academy of Pediatrics stems primarily from a concern that objects contribute to an increased risk for sudden infant death syndrome. The largest risk seems to occur when an infant is placed on top of a soft sleeping surface, such as a sheepskin or pillow.<sup>19</sup> Potential sleep aids need to be chosen with these

recommendations in mind. Parents who value the practice of cosleeping also may object to the introduction of sleep aids, with the thought that an object is not a valid substitute for a parent in soothing a young child.<sup>20</sup> The study of sleep aid use is most applicable to Western parents who want to promote self-soothing.

There are 2 main limitations to the extant research on sleep aid use. First, previous studies of nighttime object use have relied mostly on parental report,<sup>13–17</sup> the validity of which is uncertain. It is possible that parents are not aware of objects that children may use after parental departure at bedtime or during the middle of the night. Indeed, if children fall back to sleep on their own, parents are often unaware that an awakening occurred at all.<sup>3</sup> The second limitation to existing research is that previous studies have relied on cross-sectional designs to infer what occurs across age.<sup>13–16</sup> There are no longitudinal studies of object use at night.

Furthermore, there have been no studies to date that have attempted to facilitate the development of self-soothing by introducing a novel sleep aid during the first year of life. One stimulus that seems to be particularly attractive to infants is their mothers' scent. Given a choice between a pad scented with an unfamiliar mother's breast milk and a pad scented with their own mother's breast milk, even very young infants will orient toward their own mother's scent.<sup>21</sup> Nonhuman mammalian studies also support the importance of maternal olfactory cues in early neonatal orienting and settling behavior.<sup>22</sup> It is likely, then, that an object that smells like the mother may be an attractive sleep aid to an infant. The use of maternal odor as a component of a novel sleep aid was explored initially in a small pilot study, the results of which were inconclusive.<sup>23</sup>

The current investigation was designed to assess whether introducing a sleep aid infused with maternal scent at different ages would impact infants' self-soothing. A separate investigation, to be reported elsewhere, assessed the effects introducing a scented versus a control sleep aid on self-soothing. In addition to examining the use of the specific, novel sleep aid, the current study examined other types of objects that parents spontaneously provided their infants. Given the results of previous work, it was expected that infants who used a sleep aid would self-soothe more than infants who did not use a sleep aid. The study also examined infants' use of both the novel and parent-provided sleep aids over a 3-month period to see whether infants tended to persist in using 1 object, or tended to use different objects as they grew.

In addition to addressing these 2 primary questions, the current study attempted to examine 3 subsidiary issues raised by previous research. To ascertain the degree of accuracy in parental report of sleep aid use, objective data obtained from nighttime video recordings were compared with what parents reported. In addition, parents were asked to rate their comfort with different types of sleep aids; these data were then compared with actual sleep aid use to determine the concordance between the 2. Finally, to examine whether sleeping context may impact the use of sleep aids, infants who slept in their own rooms versus their parents' rooms were compared.

## METHODS

### Participants

The study was approved by the institutional review board of the University of California, Davis. Approximately 20 infants (10 males) were recruited into each of 4 age groups: 3, 6, 9, and 12 months. A total of 88 families were recruited from local "mother and infant" social groups and flyers placed in the offices of local pediatricians. Each primary caregiver gave full informed consent before participating. Because of the withdrawal of 2 families after they had given informed consent but before they had begun the protocol, the final sample included 86 infants (43 females).

Exclusion criteria were any evidence of 1) an abnormal pregnancy or delivery or chronic health problem in the mother or infant, or 2) plans to cosleep with the infant in a family bed. The definition of cosleeping used for this study was parent-infant bedsharing practiced for the majority of nights in a typical week. All infants were full-term and all were in good health after birth and at the time of study. Seventy-two percent of participating infants were first-born, 23% were second-born, and 5% were third-born. The birth order distribution did not differ significantly by age. Eighty-four percent of the infants were delivered vaginally with no complications. The remainder (16%) was delivered via cesarean section. The mean birth weight for all infants was 3545 g (standard deviation: 448.16 g; range: 2381 g-4536 g). Ninety-two percent of the families were classified as middle or upper socioeconomic status on the Hollingshead scale.<sup>24</sup> Sixty-five infants (75.6%) were white, 11 (12.8%) were multi-ethnic, 5 (5.8%) were Asian, 3 were Hispanic (3.5%), and the remaining 2 were classified as black and “other,” respectively.

## Study Design

This study used a cross-sequential research design in which 4 cohorts were examined at overlapping ages from 3 to 15 months. Each infant was studied on 3 occasions: their starting age of 3, 6, 9, or 12 months (Time 1), then 2 weeks later (Time 2), and finally, 3 months from Time 2 (Time 3). Figure 1 displays the design in detail.

Time 1 served as a baseline, followed by the introduction of a novel sleep aid 2 weeks later at Time 2, and a follow-up recording 3 months later at Time 3. Each occasion included 2 nights of videotaping the infant’s sleep in his/her natural environment. Thus, each infant had 6 nights of video-recorded sleep for analysis.

## Procedure

The Time 1 videotaping was scheduled at or near each infant’s (3-, 6-, 9-, or 12-month) birthday. The video-recording procedure has been described in detail previously.<sup>3</sup> Briefly, a research assistant sets up the video equipment during the day and returns to remove the equipment after the second night of taping. Parents initiate the VCR when they put their infant into the crib for nighttime sleep and stop the recording when the child wakes up for the day. Telephone contact is maintained during the 2 days of each videotaping to make sure the equipment worked and to record the mother’s verbal report of the child’s sleep and sleep aid use for each night. Parents are instructed to adhere to their normal routines, including the provision of any sleep aids that they normally furnish.

After the Time 1 baseline videotaping, mothers were asked to alternate wearing 2 T-shirts during their nighttime sleep for 2 weeks. The T-shirts were extra large in size so that they could be worn as nightgowns. All mother-infant nighttime interactions, such as nursing and comforting, were conducted while wearing the T-shirt. Telephone contact was maintained (on average, twice weekly) while the mothers wore the T-shirts to inquire how the child was sleeping and to confirm that mothers were complying with the wearing protocol. At the Time 2 videotaping, 1 of the 2 T-shirts was tied into a double knot and placed into the infant’s crib as a novel sleep aid, a soft object impregnated with maternal odors. The second T-shirt was kept in a sealed plastic bag after initial wearing to be used as a backup if needed. Two nights of videotaping recorded the infants’ first exposure to the novel sleep aid. The T-shirt remained in the crib and at monthly intervals a research assistant contacted the mother to determine how the child was sleeping and to ask her to “refresh” both shirts. Mothers were provided with perfume-free laundry detergent and were instructed to wash and rewear the backup T-shirt for at least 2 nights. Once the backup T-shirt was refreshed, it was placed into the crib and the original T-shirt was washed, reworn, and stored in the sealed plastic bag as a backup. The

purpose of refreshing the T-shirts was to ensure that the mother's scent was restored. Three months after Time 2, 2 final nights of sleep were recorded.

### Apparatus and Materials

Sleep aid use was recorded using a portable time-lapse video-recording system described in detail previously.<sup>25</sup> The system includes a time-lapse videocassette recorder (Panasonic AG-6740P, Secaucus, NJ), a camera requiring low levels of illumination (Panasonic WV-CD810 or Sanyo VDC-9212, Chatsworth, CA) that sits atop a tripod next to the child's crib, a small video monitor, and a microphone to record any infant sounds during the night. The video and audio signals are recorded using the 18-hour mode on the VCR such that a full 18 hours can fit onto 1 standard 2-hour VHS tape. Clock time is recorded on the videotape by an internal time-code generator.

Caregivers also were asked to fill out the Sleep Aid Questionnaire, an instrument developed in our laboratory to assess primary caregivers' feelings toward various soothing objects. Primary caregivers rated their level of comfort with the different objects on a scale from 1 (do not like) to 5 (preferable/great). The questions addressing soft objects and pacifiers were used in the current study.

### Sleep Aid Coding

The videotapes were coded according to the procedures described previously.<sup>3</sup> Trained observers coded sleep-wake states, self-soothing, and object use. Self-soothing was defined as an infant falling back to sleep with no parental intervention after a nighttime awakening. A self-soothing index was derived for each night by computing the percentage of total awakenings that resulted in self-soothing for that night. Sleep aid use was defined as an infant's volitional holding, touching, and/or sucking on an object during wakefulness. Instances of "accidental" touching during the night (eg, during sleep or while changing positions) were not scored as "use." Coders noted each instance of sleep aid use at the beginning of the night if the child was placed in the crib awake, and after middle-of-the-night awakenings. While watching the videotape, 6 categories of object use were scored: (a) soft object (blanket, cloth diaper, stuffed toy, etc); (b) pacifier; (c) thumb/finger/hand; (d) odor-laden T-shirt; (e) combination of a, b, c, or d; and (f) none. For each night, a single rating of sleep aid use was derived after scoring the entire tape. For the Time 1 (baseline) video recording, the odor-laden T-shirt was not available, so category (d) was not applicable. Three research assistants scored the majority of videotapes for the analyses reported in this study. Reliability between observers was established and maintained at 85% agreement throughout the study. Any disagreements were discussed until consensus was reached.

During the telephone contact that occurred after each night of videotaping, research assistants asked the caregiver whether or not their child had used a sleep aid, and if so, what s/he had used on that particular night. Caregivers' responses were classified into the same 6 categories used by the video coders.

### Data Analysis

All data were analyzed using the Statistical Package for Social Sciences, Version 10 (SPSS Inc, Chicago, IL). Each infant had 2 nights of data for each of the 3 recording periods. Thus, infants could have used different objects on each of the 2 nights or used an object on one night but not on the other. The 2 nights at each age were compared using the contingency coefficient to test whether infants' object use was consistent across both nights. Correlations ranged from 0.71 to 0.90 ( $P < .05$ ) at all 3 videotaping occasions, indicating that infants tended to use the same objects from night to night. Therefore, a single sleep aid code was created for each time period to represent use over both nights. In the event that different sleep aids were used on

each night, the infant was given the code, “combination.” In the event that infants used a sleep aid on one night, but used nothing on the other night, the infant was coded as using the object.

To examine potential changes in the type(s) of sleep aids used over time for individual infants, sleep aid use was compared descriptively between Times 2 and 3. Age group differences and differences in sleep aid use based on location of the crib were examined using  $\chi^2$ . Concordance between 1) maternal report of sleep aid use and sleep aid coding by research assistants, and 2) caregivers’ comfort with objects and infants’ choice of objects were computed using the contingency coefficient.

## RESULTS

There were no gender differences in sleep aid use either collapsed across age groups or within age, so all results are reported for males and females combined. Unless otherwise specified, data on sleep aid use reported here were derived from the objective video recordings.

### Types of Sleep Aids Used at Time 1 (Baseline; Table 1)

**Three-Month-Olds**—Overall, 19 (82.6%) of the 23 3-month-old infants used some type of sleep aid; only 4 infants did not use any type of object. The largest proportion of 3-month-olds used their thumbs, fingers, or hands as soothing objects. The next most common category of sleep aid use was a combination of different objects. A minority of infants used pacifiers and soft objects.

**Six-Month-Olds**—Overall, 95.2% of 6-month-old infants used some type of object at Time 1. The greatest proportion of 6-month-olds used soft objects. Similar to the 3-month-olds, the next most common pattern noted was the use of a combination of objects. Contrary to the 3-month-olds, however, only four 6-month-old infants used their thumbs, fingers, or hands as soothing objects, 3 used a pacifier, and only 1 infant did not use anything.

**Nine-Month-Olds**—Overall, 73.7% of 9-month-olds used some type of object at Time 1. Infants most commonly used a combination of objects. The next most common sleep aid of choice was a soft object, followed by a pacifier. Five infants used nothing at all.

**Twelve-Month-Olds**—Overall, 68.4% of 12-month-olds used some type of object at Time 1. As was the case with the 9-month-old group, 12-month-old infants most frequently used a combination of objects or nothing at all.

### Use of the T-shirt at Time 2

Among the 3-month-olds, 7 infants (30.4%) incorporated the T-shirt into their repertoire at Time 2, although none exclusively used this object. In the 6-month-old group, more than half (57.1%) began to use the T-shirt on its introduction. Among the 9-month-olds, 6 infants (31.6%) incorporated the T-shirt as a soothing object. Finally, in the 12-month-old group, 7 infants (36.8%) used the T-shirt as a soothing object. Thus, the 6-month-olds seemed to be most interested in the T-shirt when it was first introduced. Interestingly, only 2 infants used the T-shirt exclusively at Time 2; most of the users incorporated the T-shirt among other sleep aids.

### Consistency of Sleep Aid Use From Time 2 to Time 3 (Table 2)

**Three-Month-Olds**—Across the 3-month period, from 3 to 6 months old, about half of the infants (12/23, 52.2%) showed an inconsistent pattern of object use, whereas the other half (11/23, 47.8%) displayed the same pattern of object use. All 7 of the 3-month-olds that had originally incorporated the T-shirt at Time 2 continued to use it at Time 3, either exclusively

or in combination with other objects. In addition, 6 infants began to use the T-shirt at Time 3 (ie, at 6 months of age).

**Six-Month-Olds**—Over the 3-month period from Time 2 to Time 3, 11 infants (52.4%) displayed the same pattern of sleep aid use. The remaining 10 infants (47.6%) had an inconsistent pattern of object use from Time 2 to Time 3. Only half of the 6-month-olds that had incorporated the T-shirt as a soothing object at Time 2 continued to use it 3 months later at 9 months of age. No infants began to use the T-shirt for the first time at Time 3.

**Nine-Month-Olds**—The majority of infants (68.4%) had a varied pattern of object use from Time 2 to Time 3. Only 6 infants (31.6%) displayed the same pattern of object use or nonuse across the 3-month period. Again, half of the 4 infants who had started to use the T-shirt at Time 2 continued to use it at Time 3. Two additional infants began to use the T-shirt at Time 3.

**Twelve-Month-Olds**—As was the case with the 3- and 6-month-old groups, a slight majority of 12-month-old infants (55.6%) had a different pattern of sleep aid use from 12 to 15 months of age. Only 8 (44.4%) displayed the same pattern of object use or nonuse. Of the 7 infants who had incorporated the T-shirt at Time 2, only 2 continued to use it at Time 3. Two more infants began to use the T-shirt as a soothing object for the first time at Time 3.

### Object Use Between Age Groups

A  $\chi^2$  examining the types of sleep aids used by the different age groups at Time 1 revealed significant differences ( $\chi^2 [12] = 24.83; P = .02$ ). Partitioning the  $\chi^2$  table revealed that soft objects were used most commonly by 6-month-olds, whereas 3-month-olds were the greatest users of their thumbs, fingers, or hands. Those children using combinations of objects or nothing at all were equally distributed across age groups (Table 1).

To examine potential differences in general sleep aid use, rather than type of sleep aid, a dichotomous variable of user versus nonuser was computed. The proportion of sleep aid users changed across age, from 82.6% of 3-month-olds to 68.4% of 12-month-olds, but the overall difference was not significant ( $\chi^2 [3] = 5.30$ ; nonsignificant). A significant difference was revealed when the comparison was limited to the 6- and 12-month-old groups ( $\chi^2 [1] = 5.01; P = .03$ ). The 6-month-olds used sleep aids much more than the 12-month-olds. Only one 6-month-old used nothing at Time 1, compared with 6 infants at 12 months. It is striking how few infants do not use objects to self-soothe during the night.

Use of the T-shirt exhibited an interesting pattern across age. Approximately 30% to 35% of 3-, 9- and 12-month-olds used the T-shirt when it was first introduced at Time 2. However, the majority (59.1%) of 6-month-olds used the T-shirt when it was first introduced. Corroborating this age effect, 14 (58.3%) infants who began the study at 3 months of age used the T-shirt at least part of the time when they were studied 3 months later at 6 months of age. Thus, 6-month-old infants seemed to be most interested in using the T-shirt, regardless of the age at which it had been introduced.

### Sleep Aid Use and Self-Soothing

No consistent, statistically significant relationship was found between infants' use of any sleep aid and the percent of awakenings that infants self-soothed (that is, went back to sleep without parental assistance). This was true both for each age examined separately and collapsed. Similarly, no consistent significant relationship was found between use of the odor-laden T-shirt and self-soothing. The data were in the expected direction in most cases, however, with sleep aid users returning to sleep on their own more often than nonusers. There was a tendency

for infants who used a soft object to have a higher percentage of self-soothing when compared with infants who used any other type of sleep aid or nothing, but this difference was only significant at Time 2 (85.8% vs 56.4%;  $t = 3.20$ ;  $P = .01$ ).

### Comparison of Parental Report and Objective Sleep Aid Data

Overall, concordance between parental report and objective data were moderate to high. The concordance between parental report of sleep aid use and objective coding of sleep aid use ranged from 0.604 to 0.875 ( $P$  values from .00 – .49). Collapsed across age, caregiver report and objective video data were relatively similar at Time 1 ( $C = 0.62$ ;  $P = .00$ ), Time 2 ( $C = 0.60$ ; nonsignificant) and Time 3 ( $C = 0.72$ ;  $P = .00$ ). When it did occur, discordance between the 2 reports was attributable to parental underreporting of sleep aid use.

### Parental Comfort With Objects and Infants' Object Use

Mothers' comfort with pacifiers and soft objects as sleep aids was compared with the type of object their infant used. Because not every mother completed the Sleep Aid Questionnaire, the data represent a subset of the sample ( $N = 69$ ) for whom both sleep aid use and comfort data were available. There were no differences in mothers' feelings about the different sleep aids by infants' age; thus, results were collapsed across age groups. Overall, 49.3% of mothers felt negatively about the use of a pacifier by their own child, 24.6% felt that pacifier use was acceptable, and 26.1% felt positively about pacifier use. In comparison, 11.6% of mothers felt negatively about the use of soft objects by their own child, 21.7% felt that the use of a soft object was acceptable, and 66.6% felt positively about soft object use.

Mothers' comfort with a pacifier corresponded with the type of sleep aid actually used by the infant ( $C = 0.456$ ;  $P = .02$ ). Only 1 infant of a mother who did not feel comfortable with her own infant using a pacifier actually did use a pacifier. Mothers' comfort with their infants using a soft object, however, did not correspond to actual type of sleep aid used by the infants. Nevertheless, none of the infants of the few mothers who felt negatively about the use of a soft object actually used a soft object. Thus, mothers' comfort with pacifiers and soft objects corresponded relatively well with infants' actual use of these objects.

### Comparison of Sleep Aid Use in Different Sleeping Locations

Infants' sleep aid use was examined in terms of sleeping location (own room vs parents' room). Documentation of crib location was not available for every infant; thus, the analysis is derived from a subset of infants ( $N = 77$ ) for whom data on both sleeping location and sleep aid use were available. Overall, 59 infants (77%) slept in their own rooms, whereas 18 (23%) slept in their parents' rooms. A significantly higher proportion of infants who began the study at 3 months of age slept in their parents' rooms compared with the 3 older age groups ( $\chi^2 [3] = 15.52$ ;  $P = .001$ ). Sleeping location did not change over the 3-month course of the study for the majority of infants. There was a tendency for infants who slept in their parents' rooms to use their thumbs, fingers, or hands more than infants who slept in their own rooms ( $\chi^2 [1] = 3.48$ ; nonsignificant). However, because of the confounds between age, crib location, and types of sleep aids used, the meaning of this relationship is unclear.

## DISCUSSION

This study provides objective information on sleep aid use and self-soothing, both developmentally over a 3-month period, and between different age groups from 3 to 12 months of life. Curiously, the relationship between self-soothing and sleep aid use that has been reported in numerous other investigations (eg, 5, 11, 12) did not hold in the current study. It is possible that the expected relationship was not found because so many of the infants in this study used some type of sleep aid. Users far outweighed non-users at each age. Because so few



infants did not use a sleep aid, the groups were not equivalent in size and, thus, difficult to compare statistically. Differences were in the expected direction, however, with a higher percentage of self-soothing awakenings among sleep aid users.

There seemed to be no effect of the odor-laden T-shirt on infants' tendency to self-soothe. Although the T-shirt was used frequently, especially among 6-month-olds, it did not seem to aid in self-soothing. Possibly, maternal odor is not a significant soothing stimulus for infants past the neonatal period. If this is the case, however, it is difficult to reconcile the anecdotal accounts of older infants and young children attaching to objects worn by the mother (eg, a piece of a bathrobe or slip). Perhaps more likely is the possibility that the T-shirt was not "cuddly" enough for use as a soothing object. The T-shirt was knotted, so it was not like a typical blanket or small piece of cloth that some children seem to prefer. It is possible that the tactile characteristics of an object are more important than olfaction in shaping infants' choice of a sleep aid. A final possibility is that the T-shirt was not around long enough for infants to sensitize to it as a possible soothing object.

Conversely, users of parent-provided soft objects had higher percentages of self-soothing than infants using other types of sleep aids or nothing. Few infants in the current study actually used a soft object exclusively, however. Previous studies have reported that use of a soft object peaks some time after the first year of life.<sup>11</sup> It is possible that the few infants who did use a soft object were in some way more mature than the other infants, and this was reflected in their increased tendency to self-soothe.

There was a relatively large and surprising degree of inconsistency of sleep aid use in all age groups. Inconsistency in object use across time was quite similar at each of the ages, with the exception of the 9-month-old group. Approximately half (47.6%–55.6%) of the infants who began the study at 3, 6, and 12 months used different objects from Time 2 to Time 3, compared with 68.4% of the infants who began the study at 9 months of age. Nine months has been identified as an age at which a significant bio-behavioral shift occurs and during which a number of neurobiological and behavioral systems experience disruption.<sup>26</sup> It is possible that infants of this age undergo a transition in their sleep-wake patterns and types of sleep aids that they use as well.

Surprisingly, and contrary to expectation, consistency did not increase with age. The inconsistency in choice of sleep aids is particularly interesting because a sleep aid may be viewed as a first transitional attachment object. It is generally held that once a special object is adopted, it tends to be retained.<sup>27–29</sup> In her review of the literature, Litt<sup>28</sup> reported an average age across studies of about 7 years for relinquishing a special object. Furthermore, Busch<sup>27</sup> noted that attachments to first transitional objects in the first year of life are of "lasting duration." Assuming that some of the sleep aids used in the current study could be considered "first transitional objects," it was surprising to find that close to half of infants were inconsistent in their use of objects across time, and the other half most often used a combination of objects. In this regard, it is important to note that this is one of the first studies in which sleep aid use was actually compiled from observed behavior rather than noted from parental reports.

As mentioned briefly above, it was of interest to find such a small number of infants who consistently did not use any objects. Only 7 (9%) of the 80 infants with complete sleep aid data across the 3-month study period did not use an object over all 3 occasions of study. The remainder (91%) used some type of sleep aid during at least one of the 3 study periods. Furthermore, of the same 80 infants, 49 (61%) used something on all 3 occasions. Because the objects of choice did tend to change over time, it seems that infants in the first year of life display generalized use of objects after nighttime arousals rather than attachment to a specific object. The numbers of sleep aid users are similar to those reported by Wolf and Lozoff.<sup>13</sup>

These researchers found that only 19% of their sample did not use some type of sleep aid when transitioning to sleep.

The analyses of differences between age groups at Time 1 revealed interesting results as well. The types of objects that infants used were found to differ depending on age. Perhaps most interestingly, 6-month-olds were more likely to incorporate the novel, odor-laden T-shirt as a soothing object compared with all of the other age groups. This was true for both the 6-month-olds that entered the study at 6 months of age as well as the 6-month-olds that had begun at 3 months of age. It is unclear why 6 months was the key age for T-shirt use, but it is possible that it may have something to do with the fact that 6-month-olds are both able and motivated to begin to explore objects in their cribs. Indeed, this is consistent with Piaget's cognitive developmental theory, which suggests that infants of this age are beginning to focus on objects in the environment rather than their own bodies.<sup>30</sup> Three-month-olds may simply be too young to reach for and explore a variety of objects. This explanation also is consistent with the finding that 3-month-olds used their own hands as a soothing object more often than any other age group. The older age groups, on the other hand, seem to be more selective in choosing their soothing objects.

A moderate degree of concordance was evident between caregiver report of infants' use of particular objects and infants' actual use of these objects during the night. However, the concordance was not perfect, suggesting that direct observation is a more valid method of obtaining data on actual sleep aid use. In fact, where discordance was evident, the error was on the side of parental underreporting of their child's use of sleep aids. Consistency was found between caregivers' comfort with pacifiers and soft objects as soothing aids and infants' actual use of these objects. As would be expected, mothers who felt negatively about pacifiers or soft objects rarely provided these sleep aids for their infants. It would have been of interest to see whether a similar degree of consistency was found between parents' comfort with and infants' actual use of their thumbs, fingers, and hands, but these data were not available. It would be desirable to examine such consistency in future research.

The sleeping location of the infant did not seem to impact object use, although the confound with age precludes any firm conclusions. Wolf and Lozoff<sup>13</sup> reported that sleeping context did not impact children's use of a sleep object. Rather, caregiver presence at sleep onset was the more influential factor. Caregiver presence at sleep onset was difficult to determine in the present study because infants were often placed into the crib already asleep. However, it is noteworthy that at all 3 recording periods, infants who were put into their cribs awake were proportionately more likely to use a sleep aid during the night than infants who were placed into the crib already asleep.

There are several limitations to this study. First, the small sample size in each age group limits the power of the analyses within age. Second, the sample included self-selected families from a University community. Because the participants were primarily white and middle class, it was impossible to determine potential differences related to ethnicity or class.

As one of the first studies to use objective means of determining sleep aid use, however, the results provide interesting preliminary data on types of objects used and the high degree of variability in object use across the first year of life within individuals. As more and more families include 2 working parents, or single parents who work during the day, the methods whereby infants learn to self-soothe at night without waking their parents become important to understand. Also, it is important to learn what the developmental antecedents and behavioral consequences might be for infants who use and do not use a sleep aid. It is also important to study which infants establish a specific attachment object and how this process occurs. If the use of sleep aids promotes self-soothing, perhaps some sleep problems in infants could be

managed or prevented by encouraging their use. Nighttime video recording of sleep aid use offers a promising method for exploring these issues. Additional research should examine individual changes in sleep aid use in a larger group of infants studied longitudinally and over a wider age range to see whether infants become more consistent in their choice of sleep aids after the first year of life.

## SKIPPING CLASS 101

“Is 8 AM too early for you? No problem—just log on and catch up via video! . . . Playing hooky at the nation’s oldest Ivy League School has never been easier thanks to a new university service that downloads videotaped lectures and serves them up on a private Web site. . . . Students returning to Harvard are likely to follow suit, judging by the service’s popularity last spring. Joseph Forman, a senior at Harvard, says it was easy, too easy, for him to stop going to Introduction to Statistics last spring. Class started at 11 AM and Mr. Forman says he doesn’t like to wake up until noon. He skipped the entire semester and still got an ‘A’ . . . Two years ago, Harvard started a small department called The Instructional Computing Group that employs several people to videotape about 30 courses per semester and make them accessible to its students over the university’s internal Web site within hours of class. . . . the well-intentioned program may be backfiring as anecdotal evidence from professors indicates that absenteeism is on the rise. . . . Harvard isn’t the only school experimenting with online learning these days, nor the only college where students cut class. With the rise of the Internet, many schools now offer course work online. . . . Some parents blanch at the idea of their kids cutting classes at a school where costs run around \$37,000 a year.”

Jason L. *New York Times*. August 23, 2001

Noted by JFL, MD

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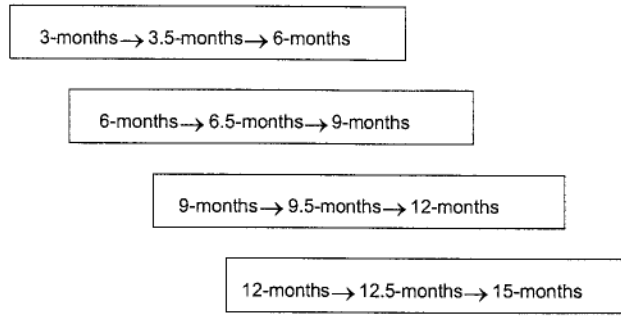
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## Cross-Sequential Study Design



**Fig 1.**  
Study design used in the current investigation.

**TABLE 1**  
Frequency (Percentage) of Infants Using Each Type of Sleep Aid by Age at Time 1

Type of Object	3-Month-Olds	6-Month-Olds	9-Month-Olds	12-Month-Olds
Soft object	1 (4.3)	7 (33.3)	4 (21.1)	2 (10.5)
Pacifier	2 (8.7)	3 (14.3)	3 (15.8)	3 (15.8)
Thumb/finger/hand	11 (47.8)	4 (19.0)	0 (0)	2 (10.5)
Combination	5 (21.7)	6 (28.6)	7 (36.8)	6 (31.6)
None	4 (17.4)	1 (4.8)	5 (26.3)	6 (31.6)
Total*	23 (100)	21 (100)	19 (100)	19 (100)

$\chi^2$  (12) = 24.83,  $P = .02$ .

\* Total represents number of infants with complete data at Time 1.

**Table 2**

## Stability of Sleep Aid Use From Time 2 to Time 3

Use Pattern	3 to 6 Months	6 to 9 Months	9 to 12 months	12 to 15 Months
Same pattern of sleep aid use	11 (47.8)	11 (52.4)	6 (31.6)	8 (44.4)
Different pattern of sleep aid use	12 (52.2)	10 (47.6)	13 (68.4)	10 (55.6)
Total*	23 (100)	21 (100)	19 (100)	18 (100)

Numbers (percentages) of infants in each category are reported.

\* Total represents number of infants with complete data at Time 2 and Time 3.